Cornell Cooperative Extension
Cornell Vegetable Program

Fragile FRAC 7 Fungicides: Part II – Field performance for control of Stemphylium leaf blight in onion in New York

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Empire State Producers (Virtual) Expo – Onion Critical Issues Session
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Grower Cooperators:

- Max Torrey, Big O, Elba
- John Dunsmoor, Oswego

CVP Technicians:

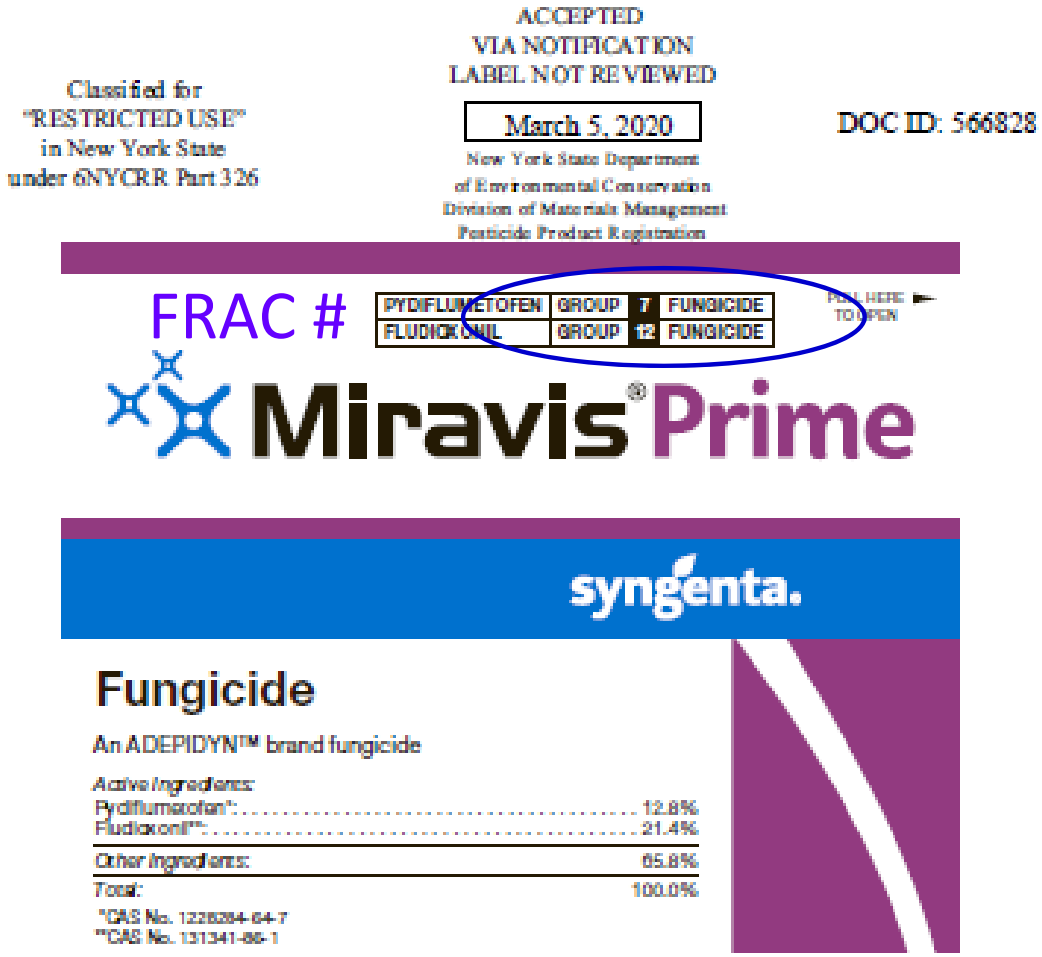
- Emma van der Heide
- Sarah Caldwell

CCE Intern:

- Taran Bauer

Products: Syngenta, Summit Agro

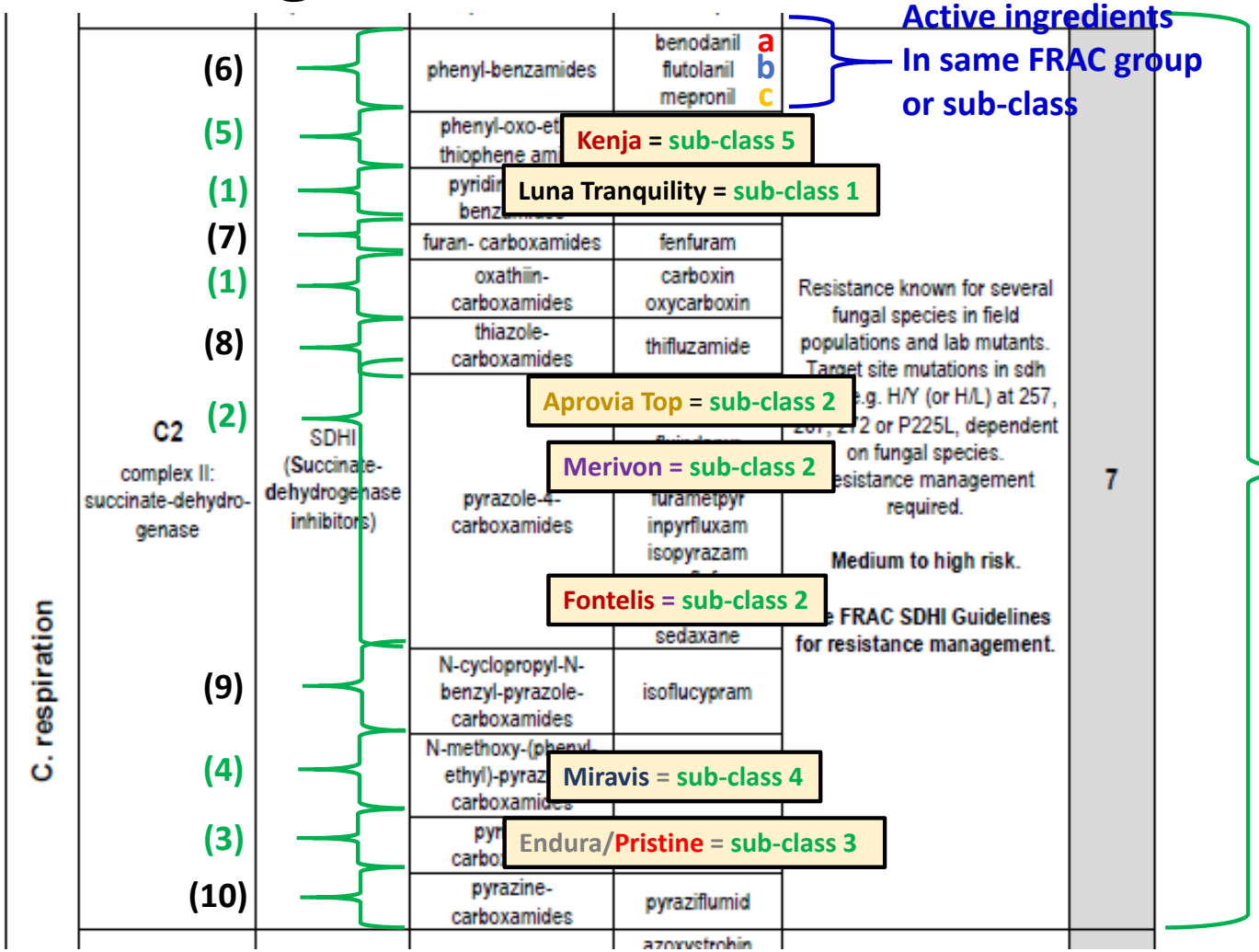
Spray by Number for Fungicide Resistance Number = **FRAC Code**



FRAC:
Fungicide **R**esistance
Action **C**ommittee

SLB Onion Fungicides FRAC 7 Sub-Classes

Sub-class coding 1, 2, 3 is a “Christy thing”, not FRAC



Active ingredient within a sub-class coding a, b, c is a “Christy thing”, not FRAC

Fungicide Active Ingredients

Trade Name	Active Ingredient	FRAC Code
Luna Tranquility	**Fluopyram** **pyrimethanil**	**7(1)** **9a**
Luna Experience	**Fluopyram** **tebuconazole**	**7(1)** **3c**
Velum Prime	**Fluopyram**	**7(1)** ★
Merivon	**fluxapyroxad** pyraclostrobin	**7(2)** **11**
Miravis Prime	**pydiflumetofen** fludioxonil	**7(4)** **12**
Kenja	**isofetamid**	**7(5)** ★

★ **NOT labeled** on onion.

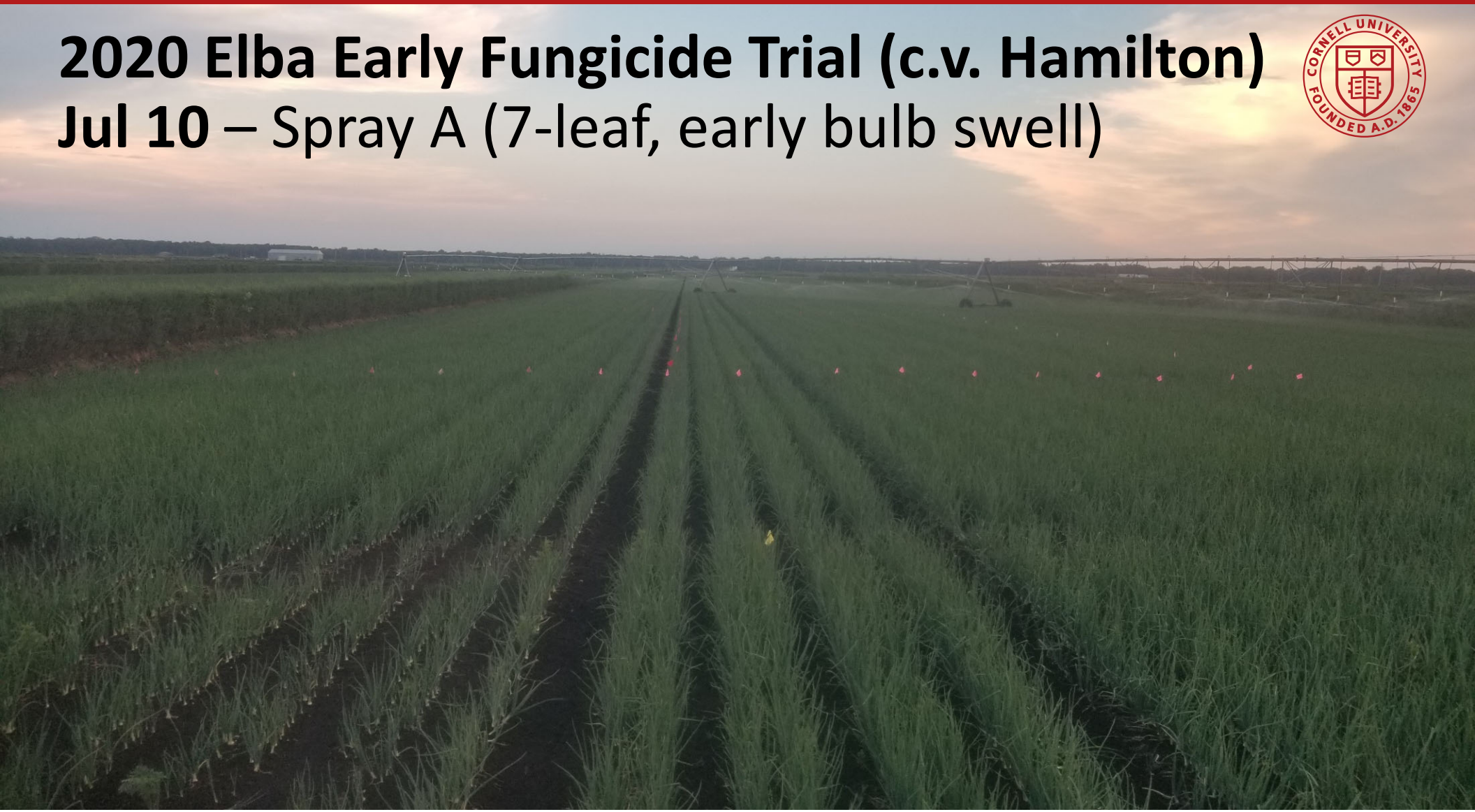
★ **NOT labeled** on onion in New York.

★ **NOT labeled** on onion for foliar use.

Trade Name	Active Ingredient	FRAC Code
Quadris Top	**difenaconazole** azoxystrobin	**3b** **11**
Tilt	**propiconazole**	**3a**
Scala	**pyrimethanil**	**9a**
Rovral	**iprodione**	**2**
Endura	**boscolid**	**7(3)**
Pristine	**boscolid** pyraclostrobin	**7(3)** **11**
Aprovia Top	**benzovindiflupyr** difenaconazole	**7(2)c** **3b**
Fontelis	**penthiopyrad**	**7(2)b** ★
Sercadis	**fluxapyroxad**	**7(2)a** ★

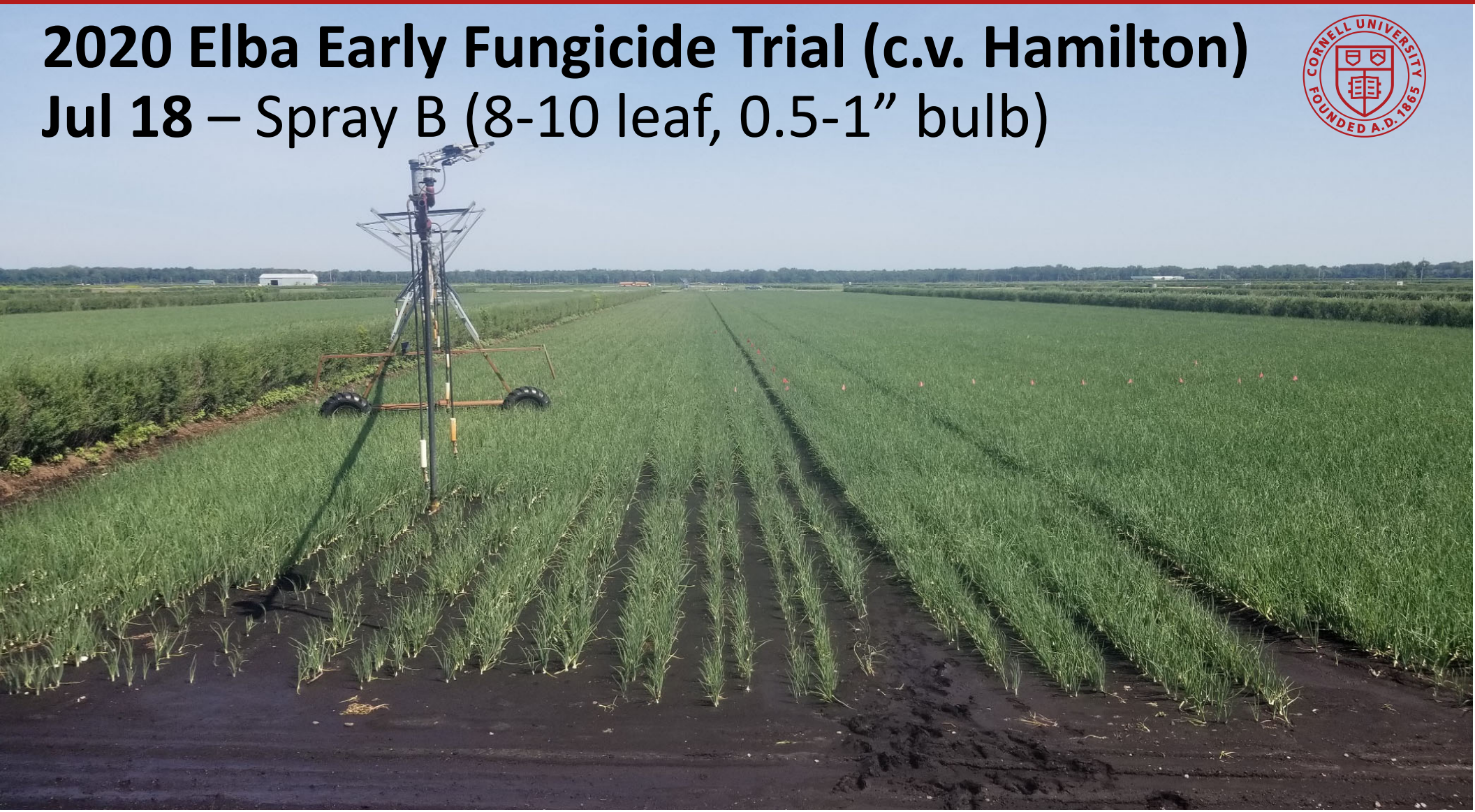
2020 Elba Early Fungicide Trial (c.v. Hamilton)

Jul 10 – Spray A (7-leaf, early bulb swell)



2020 Elba Early Fungicide Trial (c.v. Hamilton)

Jul 18 – Spray B (8-10 leaf, 0.5-1” bulb)

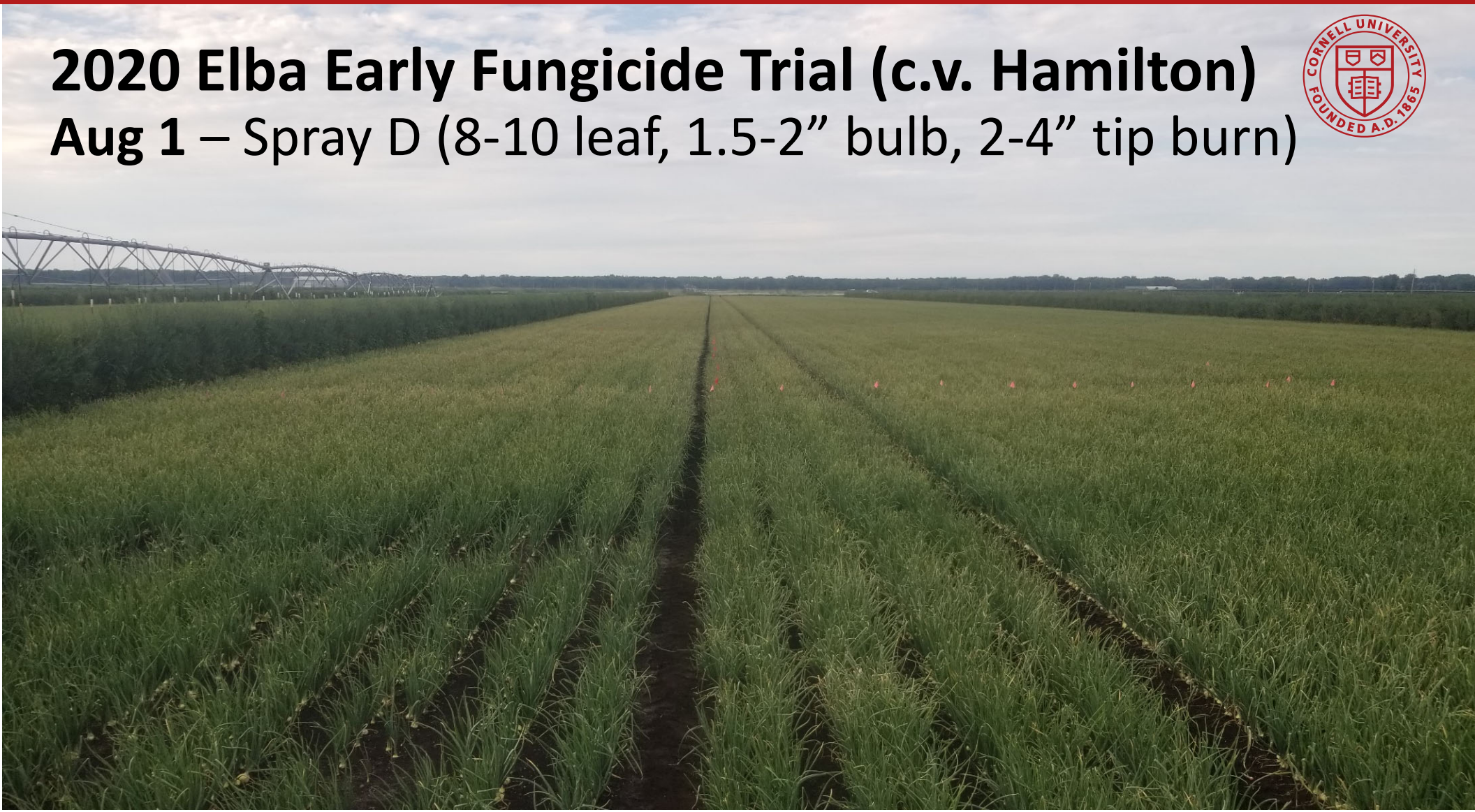


2020 Elba Product Trial (c.v Hamilton)

1st Spray Jul 24 (8-10 leaf, 1-1.5” bulb, tipburn start)

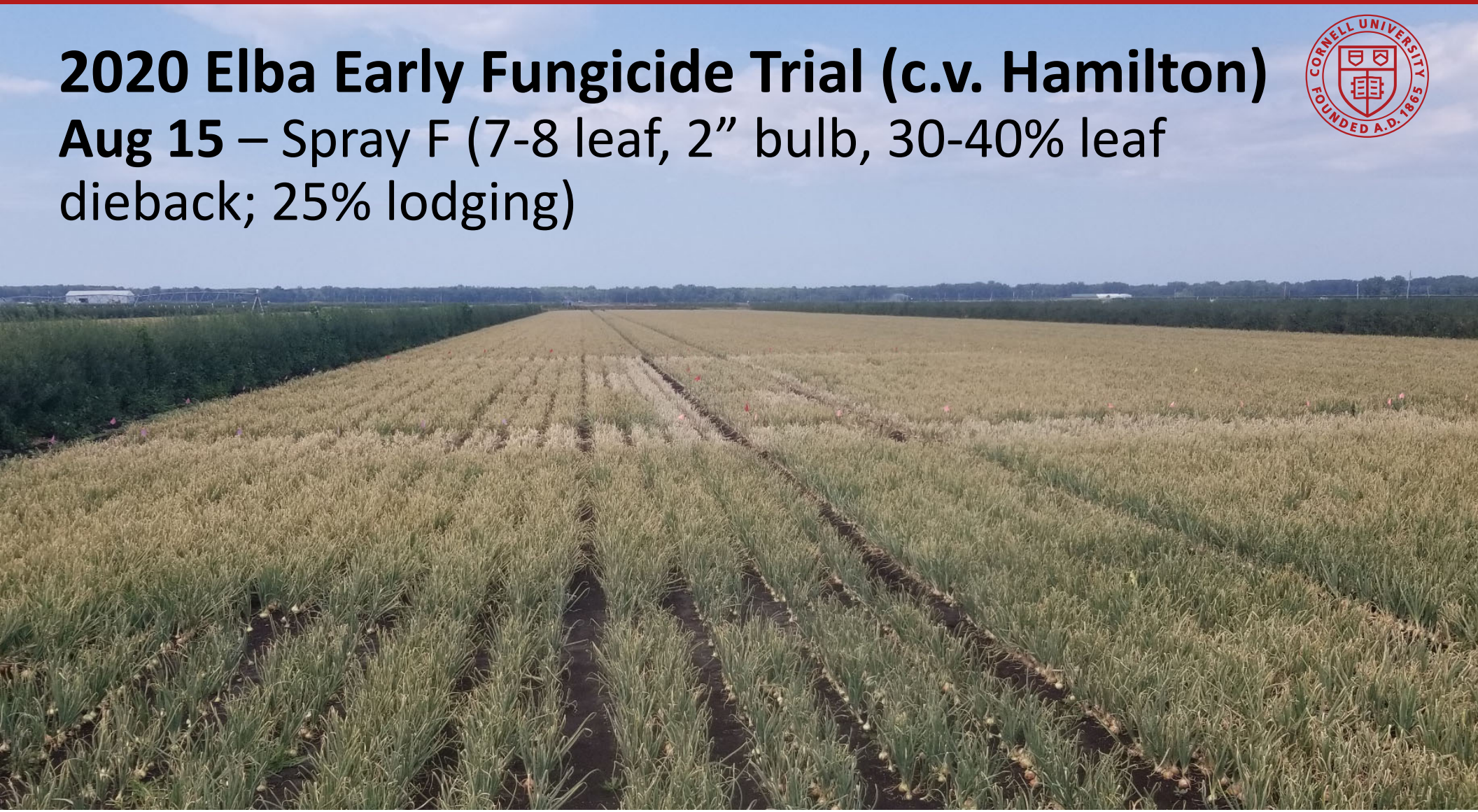
2020 Elba Early Fungicide Trial (c.v. Hamilton)

Aug 1 – Spray D (8-10 leaf, 1.5-2” bulb, 2-4” tip burn)



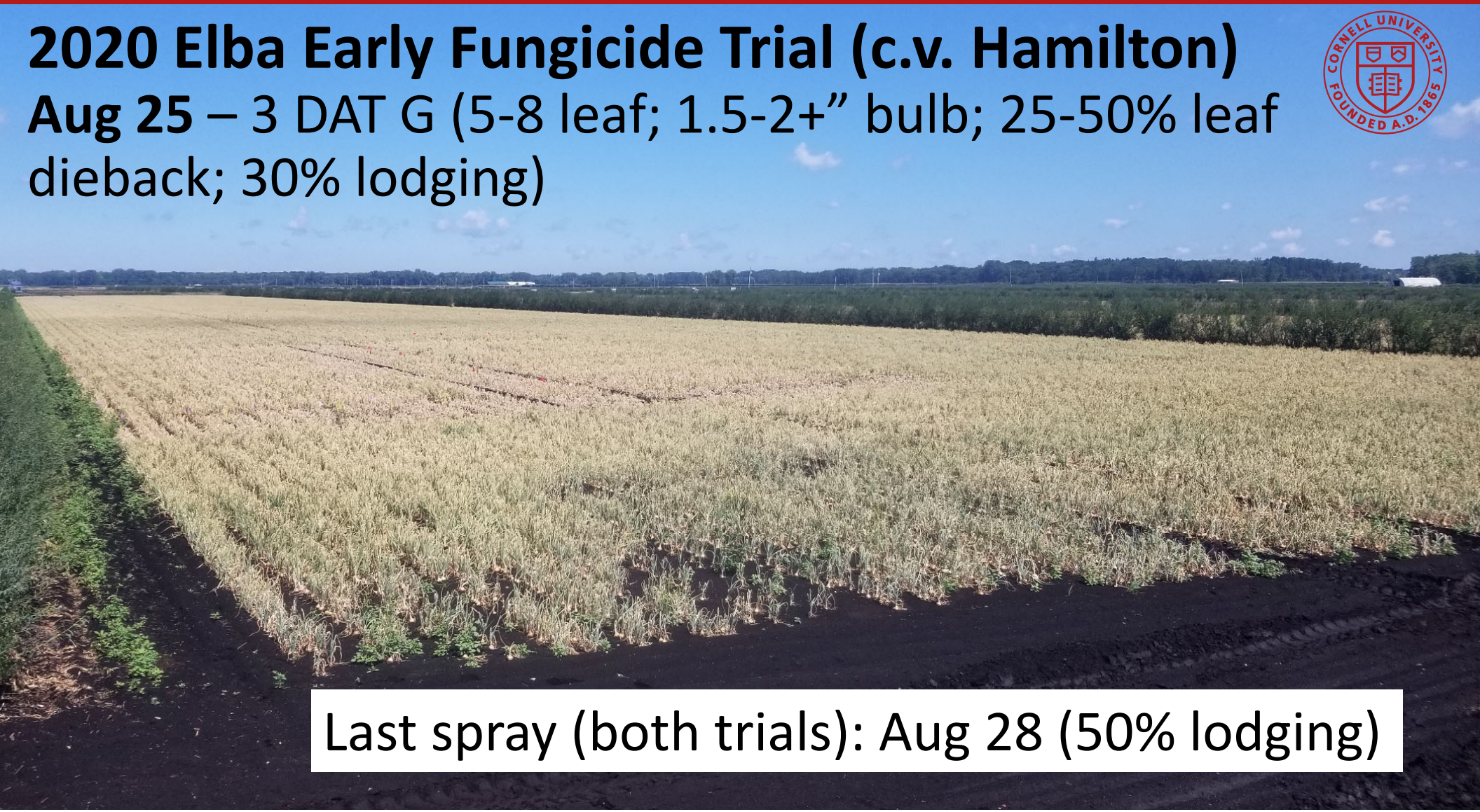
2020 Elba Early Fungicide Trial (c.v. Hamilton)

Aug 15 – Spray F (7-8 leaf, 2” bulb, 30-40% leaf dieback; 25% lodging)



2020 Elba Early Fungicide Trial (c.v. Hamilton)

Aug 25 – 3 DAT G (5-8 leaf; 1.5-2+" bulb; 25-50% leaf dieback; 30% lodging)



Last spray (both trials): Aug 28 (50% lodging)

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

2nd BEST
FRAC 3b + 3a:
Quadris Top 14 fl oz + Tilt 8 fl oz

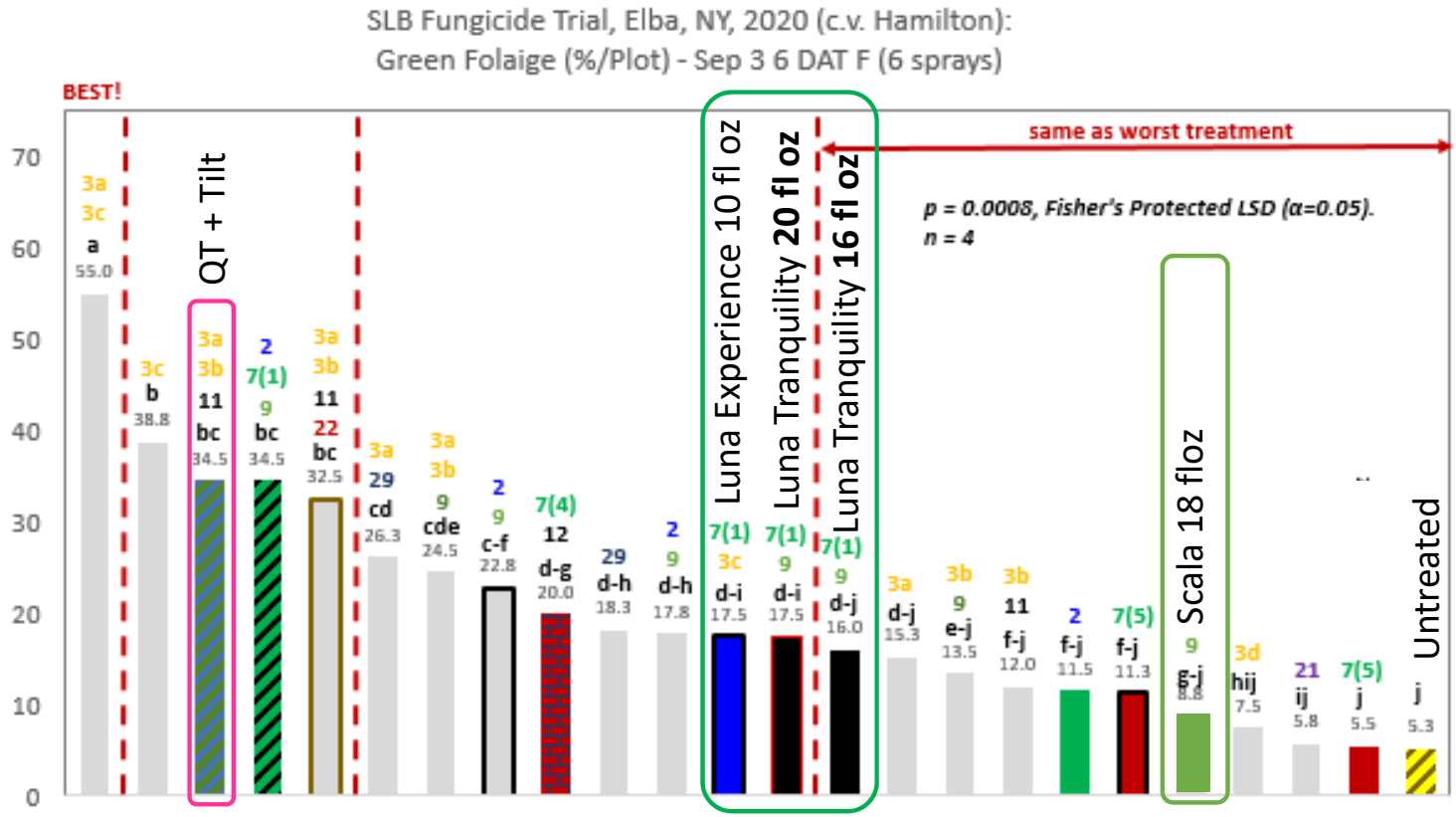
FRAC 7

Luna Tranquility **16 fl oz** 7(1) + 9a

Luna Tranquility **20 fl oz** 7(1) + 9a

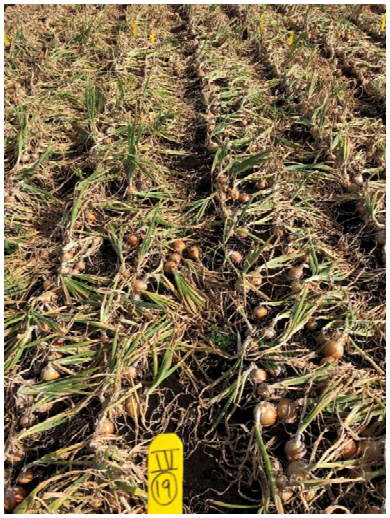
Luna Experience **10 fl oz** 7(1) + 3c

- Middle-of-the-pack/
- Significantly better than Nothing
- No difference between rates
- Significantly less green foliage than QT + Tilt



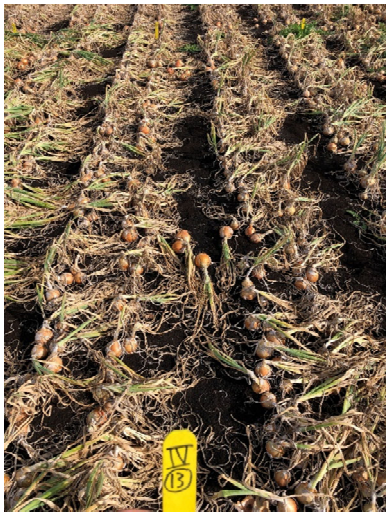
Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

34.5%	16%	17.5%	17.5%	5.3%
				
Quadris Top 14 fl oz + Tilt 8 fl oz **3b + 3a**	Luna Tranquility **16 fl oz** **7(1) + 9b**	Luna Tranquility **20 fl oz** **7(1) + 9b**	Luna Experience **10 fl oz** **7(1) + 3c**	Untreated

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

8.8%



Scala 18 fl oz

9a

16%

Luna Tranquility

16 fl oz

7(1) + 9b

17.5%

Luna Tranquility

20 fl oz

7(1) + 9b

17.5%

Luna Experience

10 fl oz

7(1) + 3c

5.3%

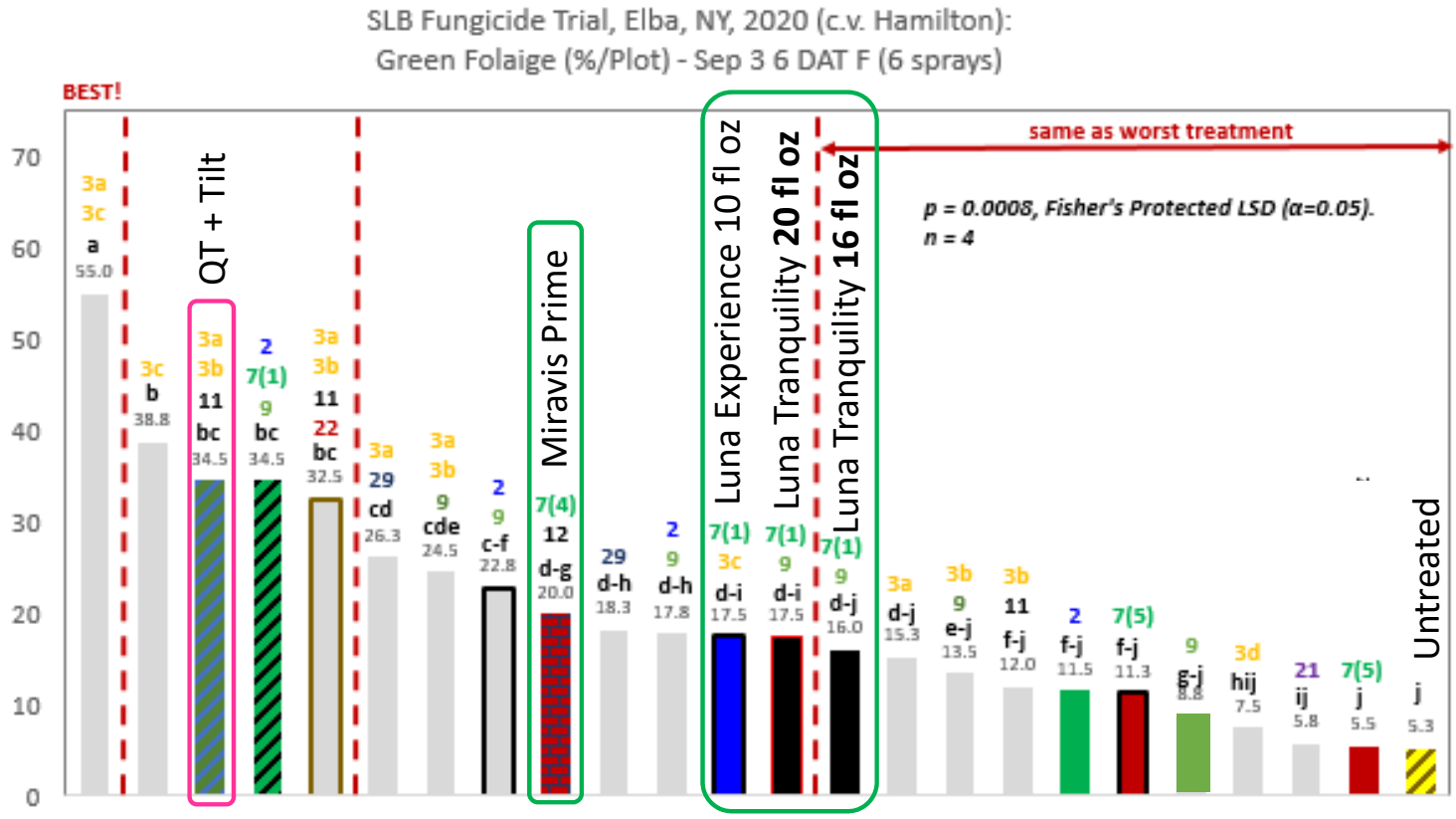
Untreated

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

FRAC 7(4)

Miravis Prime 11.4 fl oz **7(4)** **+ 12**

- Middle-of-the-pack/
- Significantly better than Nothing
- Significantly less green foliage than QT + Tilt
- Not significantly different than Luna products



Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

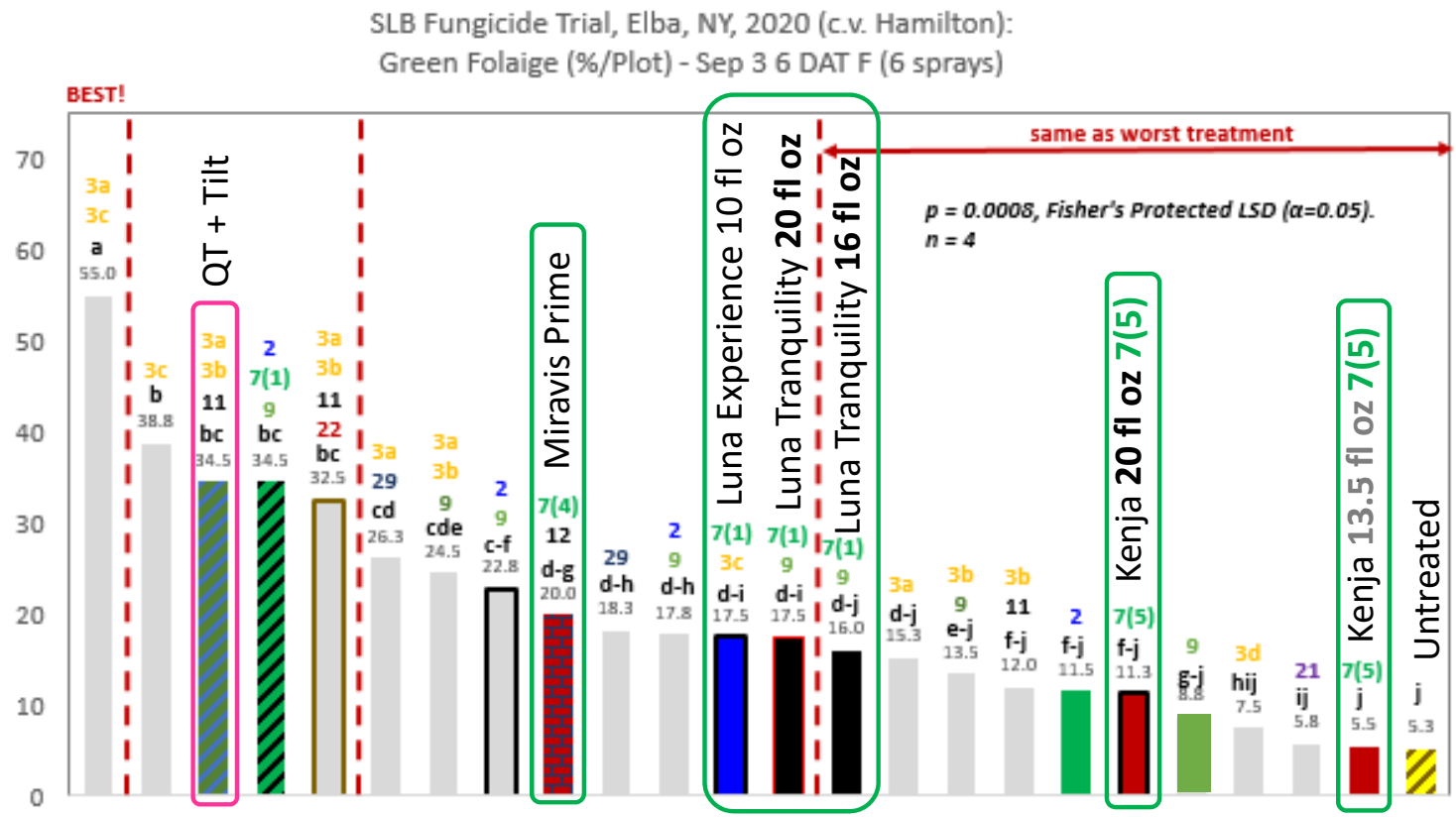
FRAC 7(5)

Kenja **13.5 fl oz** **7(5)**

Kenja **20 fl oz** **7(5)**

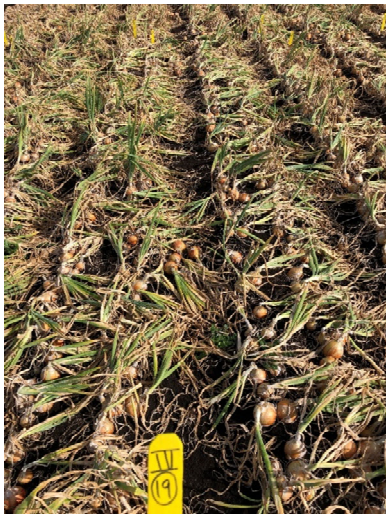
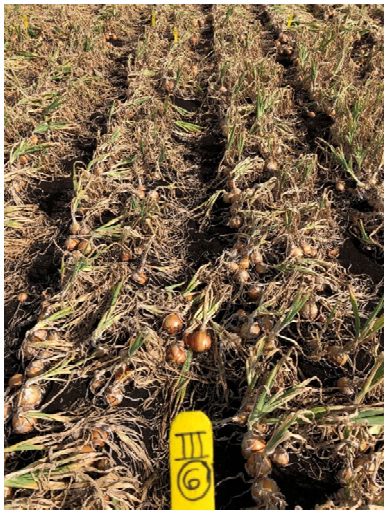
- Not significantly different than Untreated

Field performance suggests cross-resistance among sub-classes of FRAC 7 1, 4 & 5.



Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

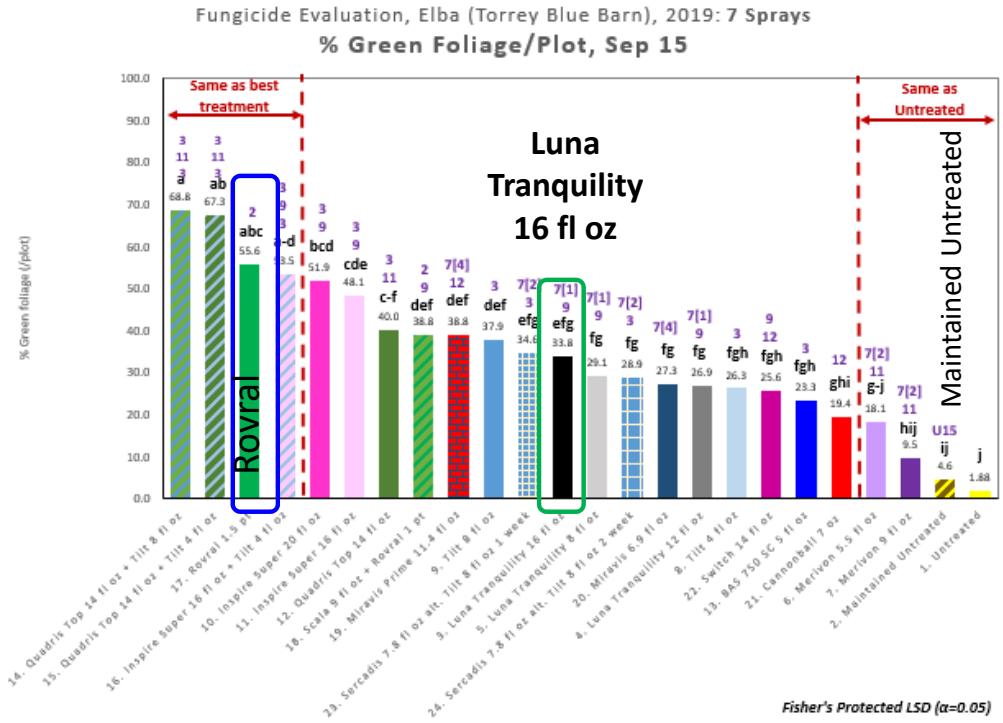
34.5%	20%	11.3%	5.5%	5.3%
				
Quadris Top 14 fl oz + Tilt 8 fl oz **3b + 3a**	Miravis Prime 11.4 fl oz **7(4) + 12**	Kenja **20 fl oz** **7(5)**	Kenja **13.5 fl oz** **7(5)**	Untreated

2019 SLB Fungicide Trial, Elba

FRAC 2

Rovral
(healthy foliage, but lots of SLB)

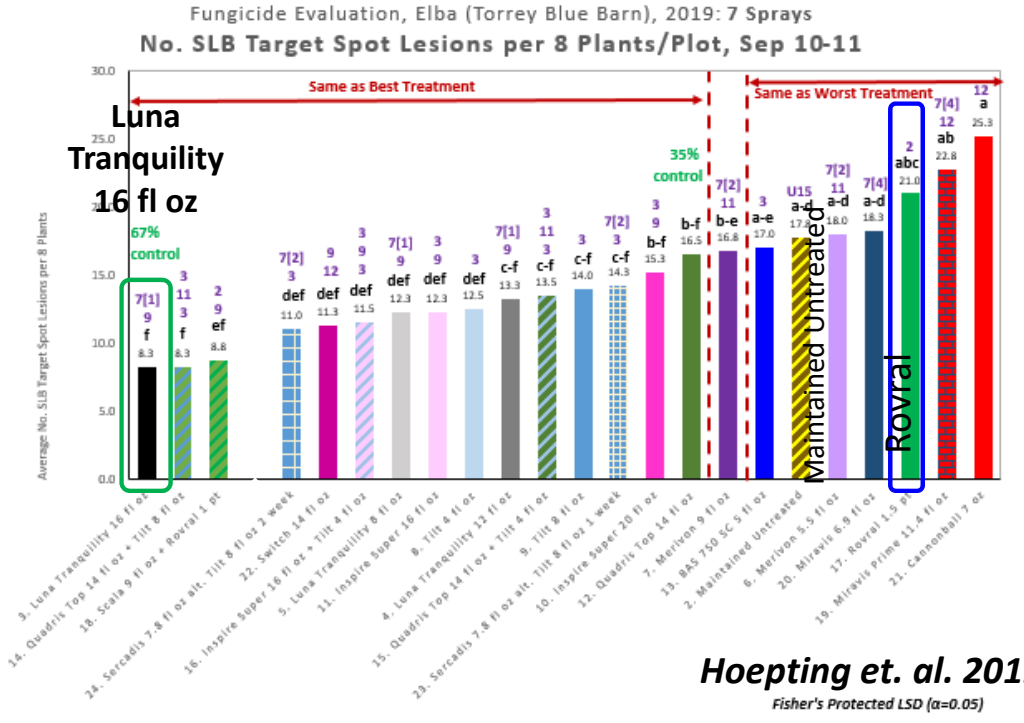
Plant Health - % **Green Foliage** (Sep 15)



FRAC 7(1)

Luna Tranquility 16 fl oz
(healthy foliage lipping, few SLB spots)

Total No. **SLB Target Spot Lesions**/8 plants



Hoepting et. al. 2019

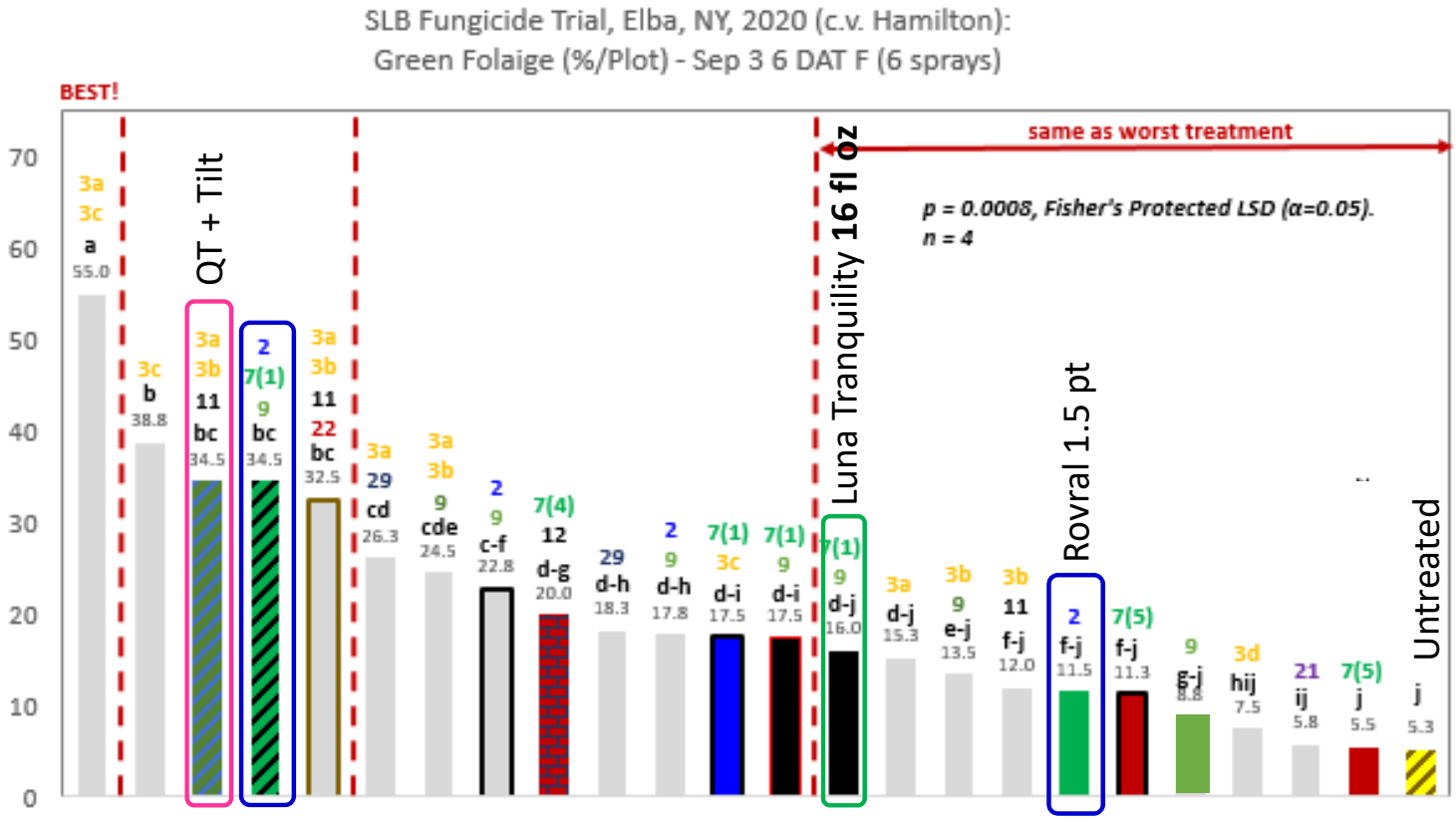
2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

FRAC 7(1) + 9a
Luna Tranquility 16 fl oz

FRAC 2
Rovral 1.5 pt

FRAC 7(1) + 9a + 2
Rovral 1 pt +
Luna Tranquility 16 fl oz

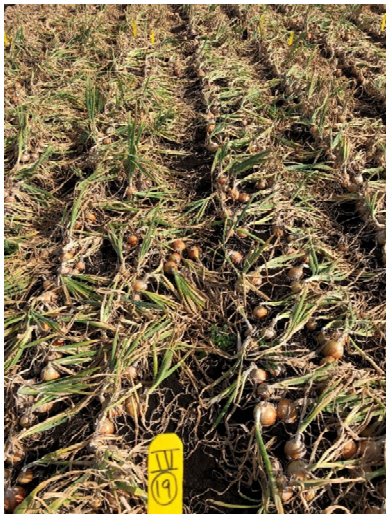
- Significantly better than either alone
- As good as QT + Tilt



Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

34.5%



Quadris Top 14 fl oz
+ Tilt 8 fl oz
3b + 3a

34.5%

Luna Tranquility
16 fl oz
+ Rovral 1 pt
7(1) + 9b + 2

16%

Luna Tranquility
16 fl oz
7(1) + 9b

11.5%

Rovral 1.5 pt
2

5.3%

Untreated

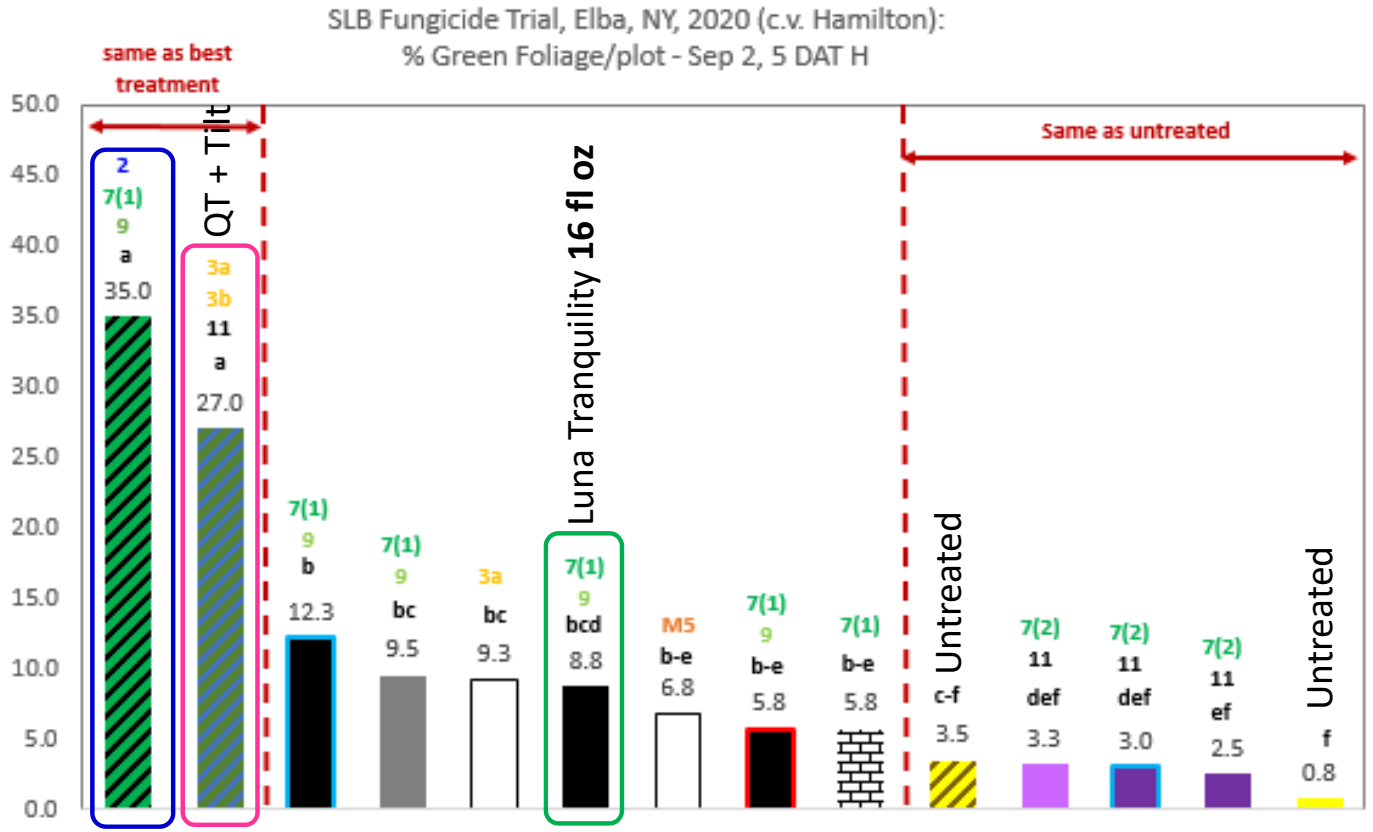
Same results in Early fungicide trial, Elba 2020

2020 Elba Fungicide Early Trial
% Green Foliage Sep 2 5 DAT H (8 sprays)

FRAC 7(1) + 9a
Luna Tranquility 16 fl oz

FRAC 7(1) + 9a + 2
Rovral 1 pt +
Luna Tranquility 16 fl oz

- Significantly better than either alone
- As good as QT + Tilt



Hoepting et. al. 2020

2020 Elba Fungicide Early Trial
% Green Foliage Aug 25 - 3 DAT G (7 sprays)

63%

Quadris Top 14 fl oz
+ Tile 8 fl oz
3b + 3a

63%

Luna Tranquility
16 fl oz
+ Rovral 1 pt
7(1) + 9b + 2

33%

Luna Tranquility
16 fl oz
7(1) + 9b

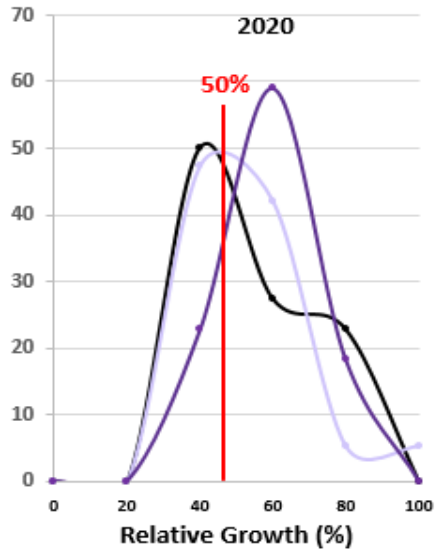
15%

Untreated
(thrips controlled)

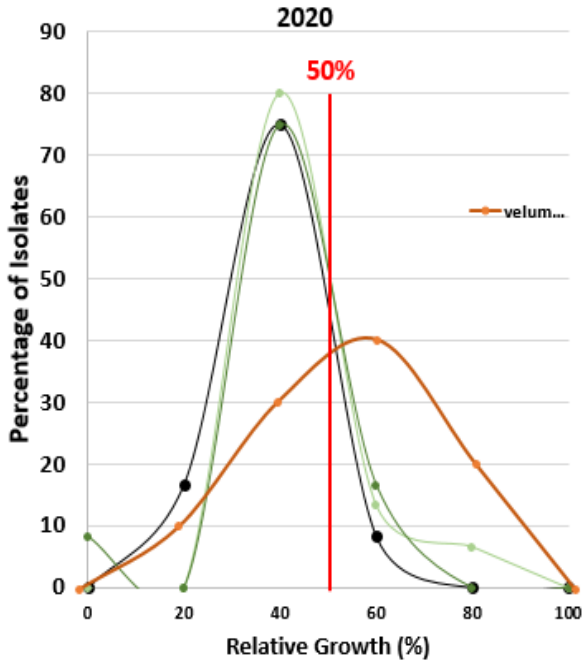
3.5%

Untreated
(no insecticides)

2020 Elba Fungicide Early Trial
Luna Tranquility vs. Merivon **Relative Growth (Katrin Ayer)**



Merivon 5.5 & 9 fl oz
7(2) + 11



Luna Tranquility 12 & 16 fl oz
7(1) + 9
Velum Prime – 7(1)

sensitive → **resistent**

- SLB isolates more resistant to Merivon than Luna Tranquility
- No difference between rates for either
- SLB isolates are more sensitive to FRAC 7(1) alone than 7(1) + 9a.

2020 Elba Fungicide Early Trial
% Green Foliage Sep 2 5 DAT H (8 sprays)

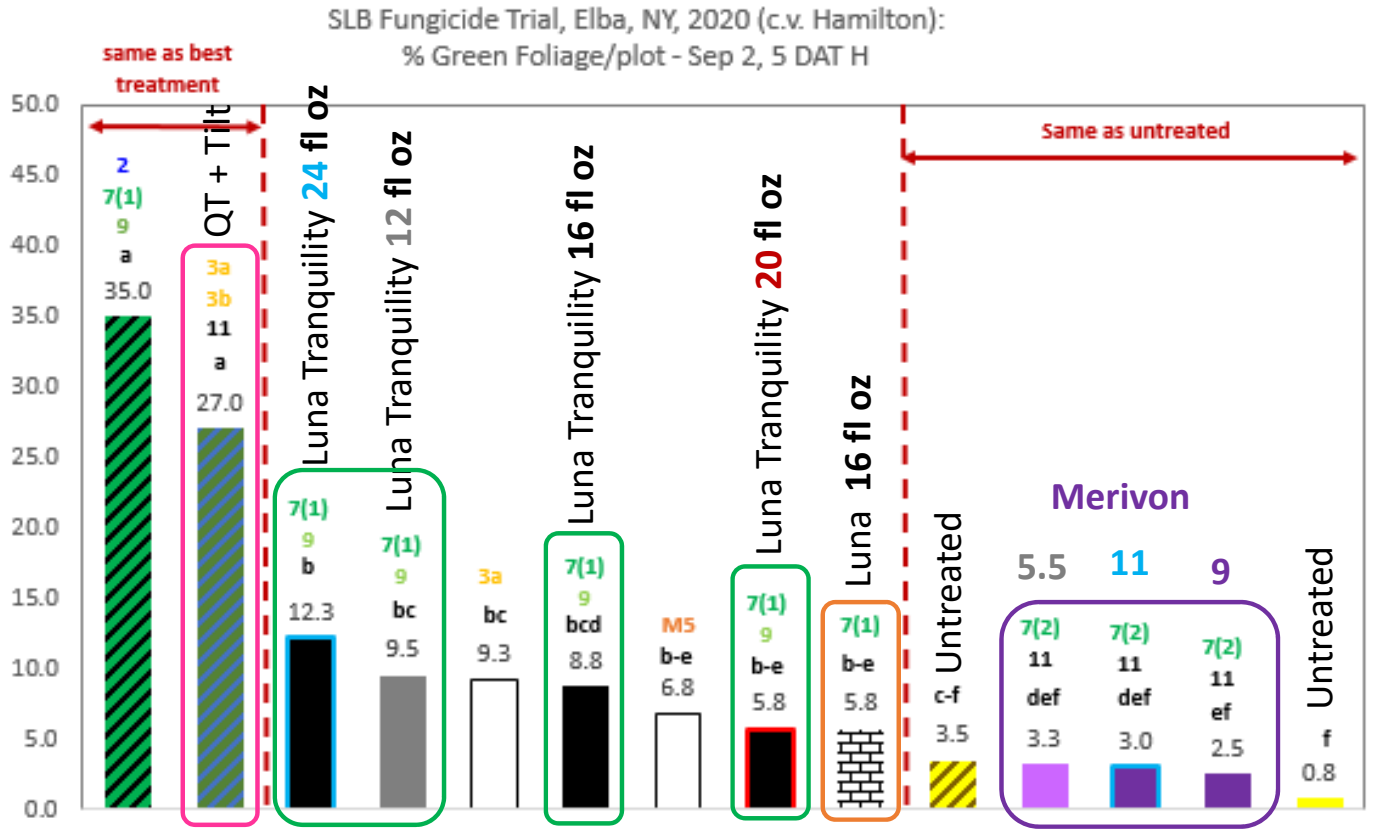
FRAC 7(1) + 9a
Luna Tranquility

- No rate relationship
- Significantly less green foliage than QT + Tilt

FRAC 7(1) Luna

FRAC 7(2) + 11
Merivon

- No rate relationship
- No different than untreated



Results suggest that increasing rate of Luna Tranquility and Merivon do not help

Hoepting et. al. 2020

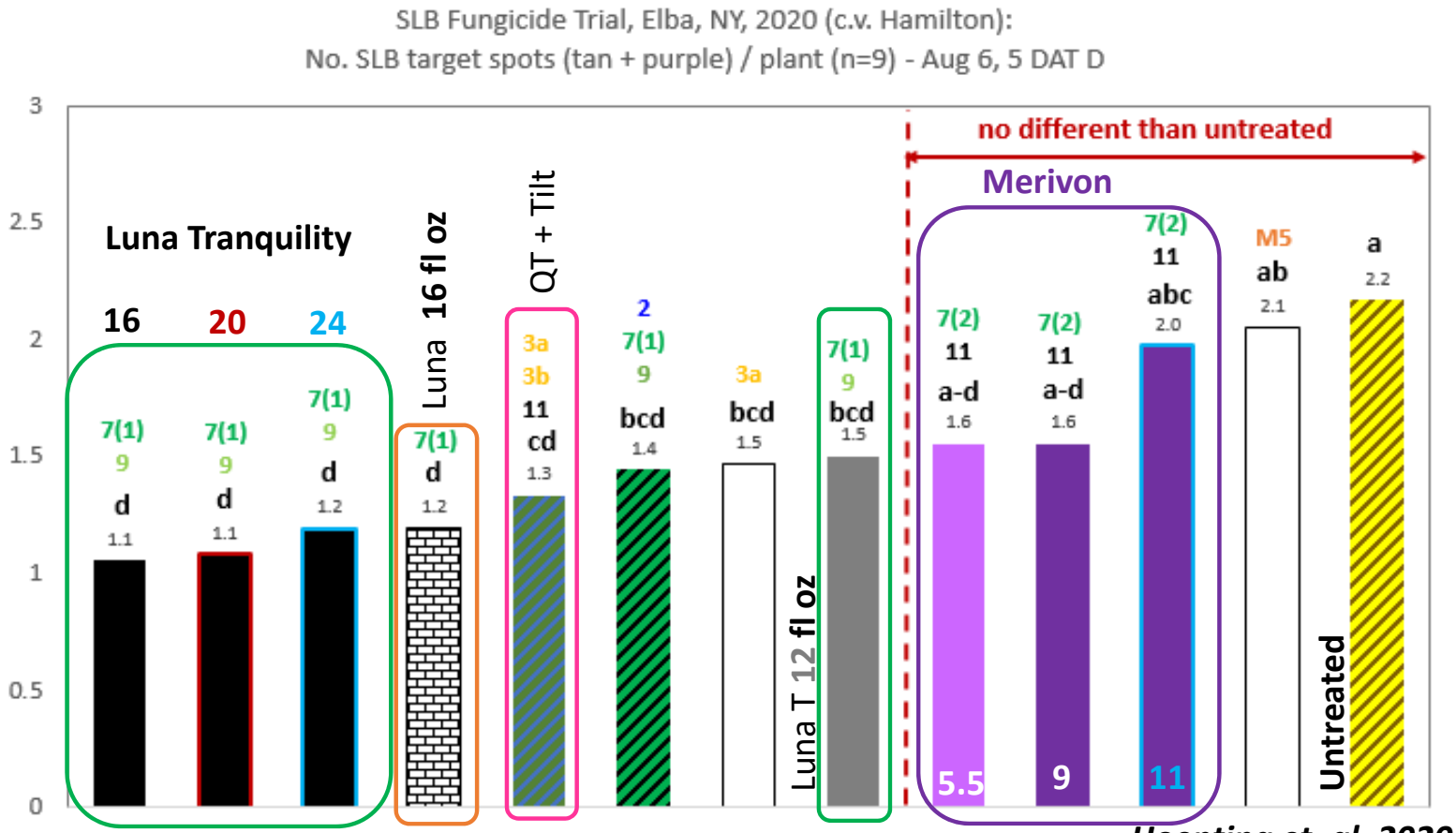
2020 Elba Fungicide Early Trial
No. SLB Target Spots/Plant Aug 6 - 5 DAT D (4 sprays)

FRAC 7(1) + 9a
Luna Tranquility

- No rate relationship between 16, 20 & 24 fl oz & Luna 16 fl oz alone.
- No different than QT + Tilt
- 12 fl oz a few more target spots

FRAC 7(2) + 11
Merivon

- No rate relationship
- No different than untreated



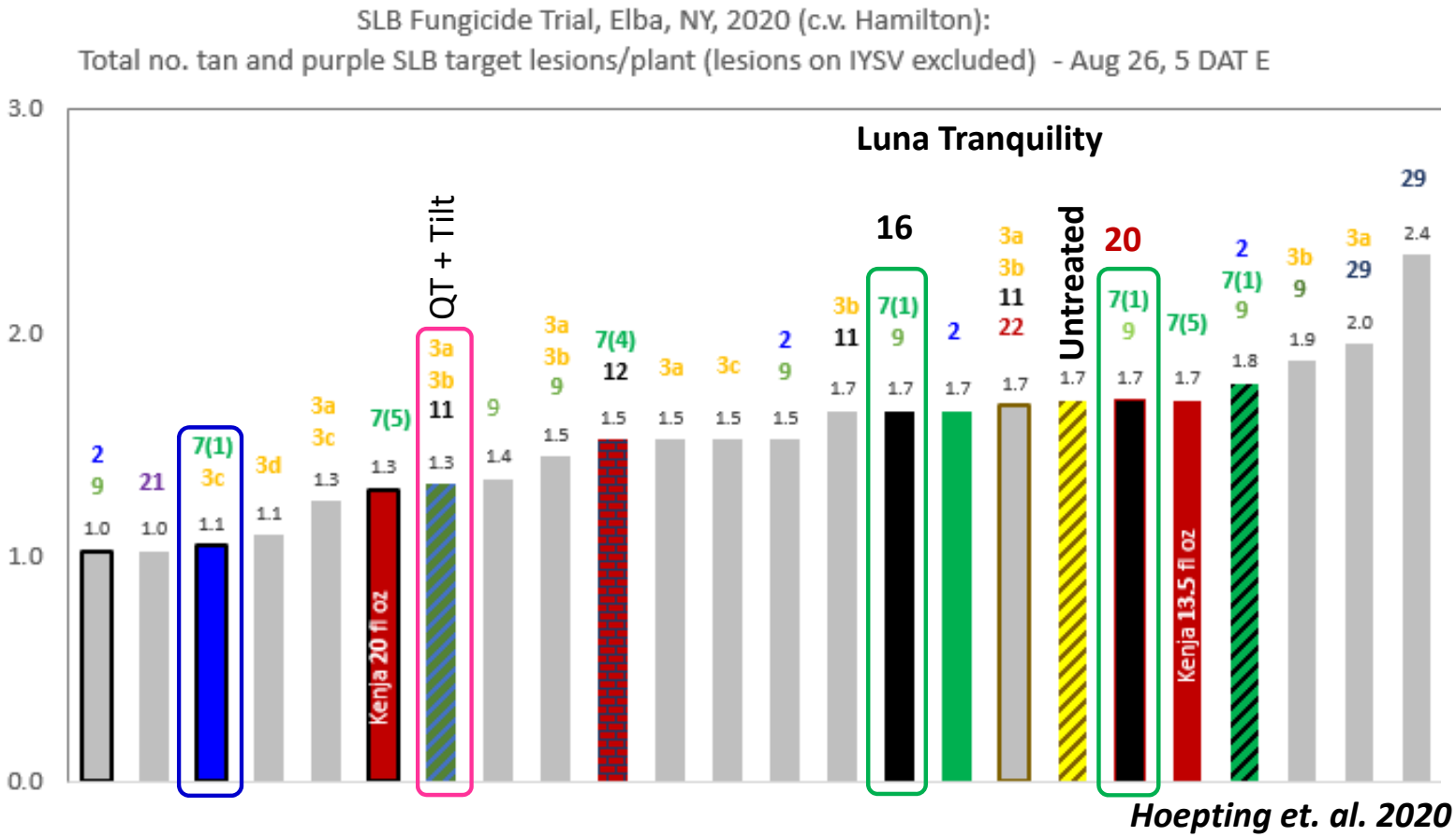
Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
No. SLB Target Spots/Plant Aug 25 - 5 DAT E (5 sprays)

FRAC 7(1) + 9a
Luna Tranquility

- No rate relationship between 16 & 20.
- No different than untreated.

- Luna Experience (**7(1) + 3c**) had fewer target spots



Hoepting et. al. 2020

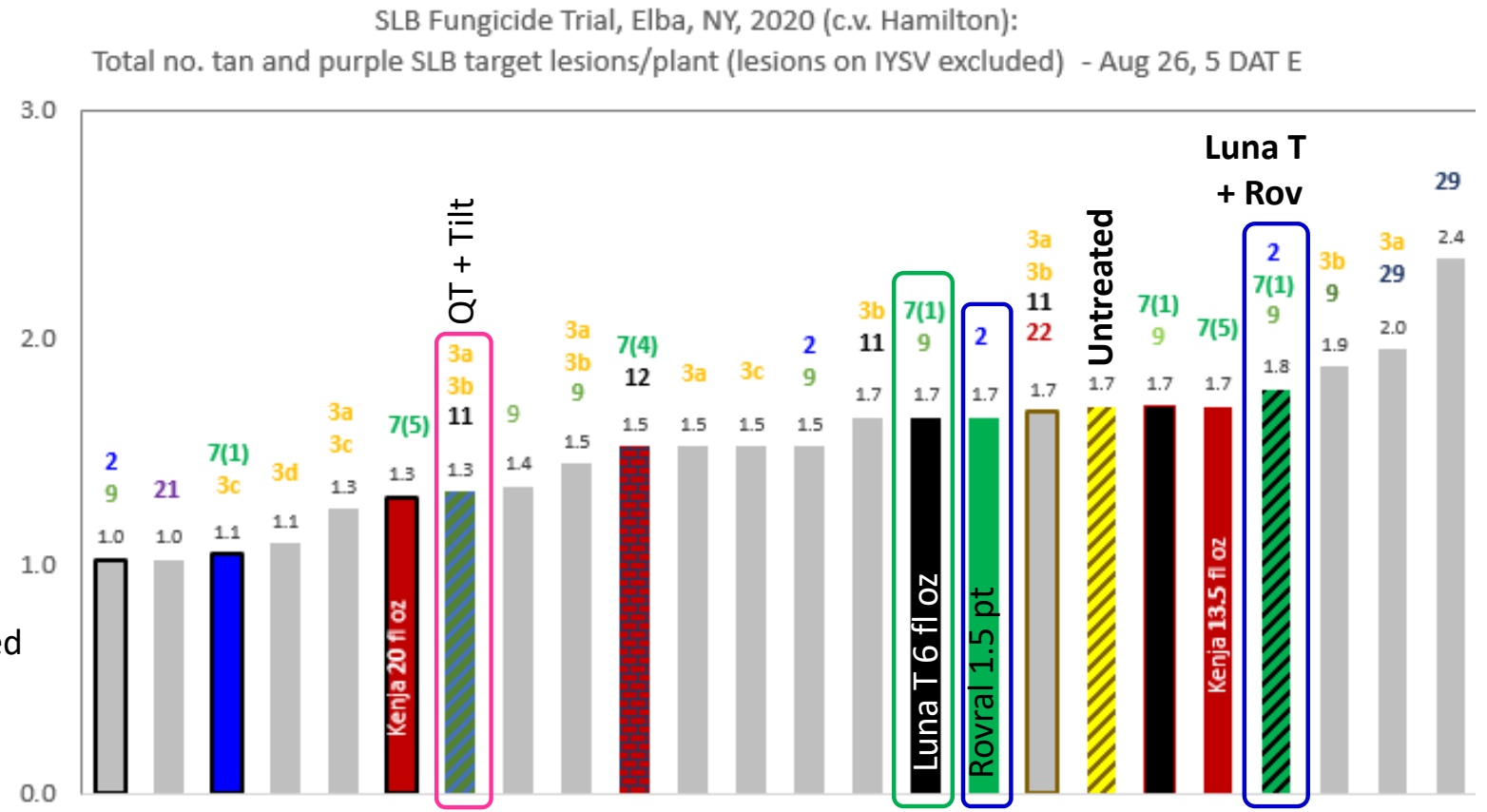
2020 Elba Fungicide Product Trial
No. SLB Target Spots/Plant Aug 25 - 5 DAT E (5 sprays)

Luna Tranquility 16 fl oz
7(1) + 9a

Rovral 1.5 pt 2

Luna Tranquility 16 fl oz
7(1) + 9a
+ Rovral 1 pt 2

Not different than untreated



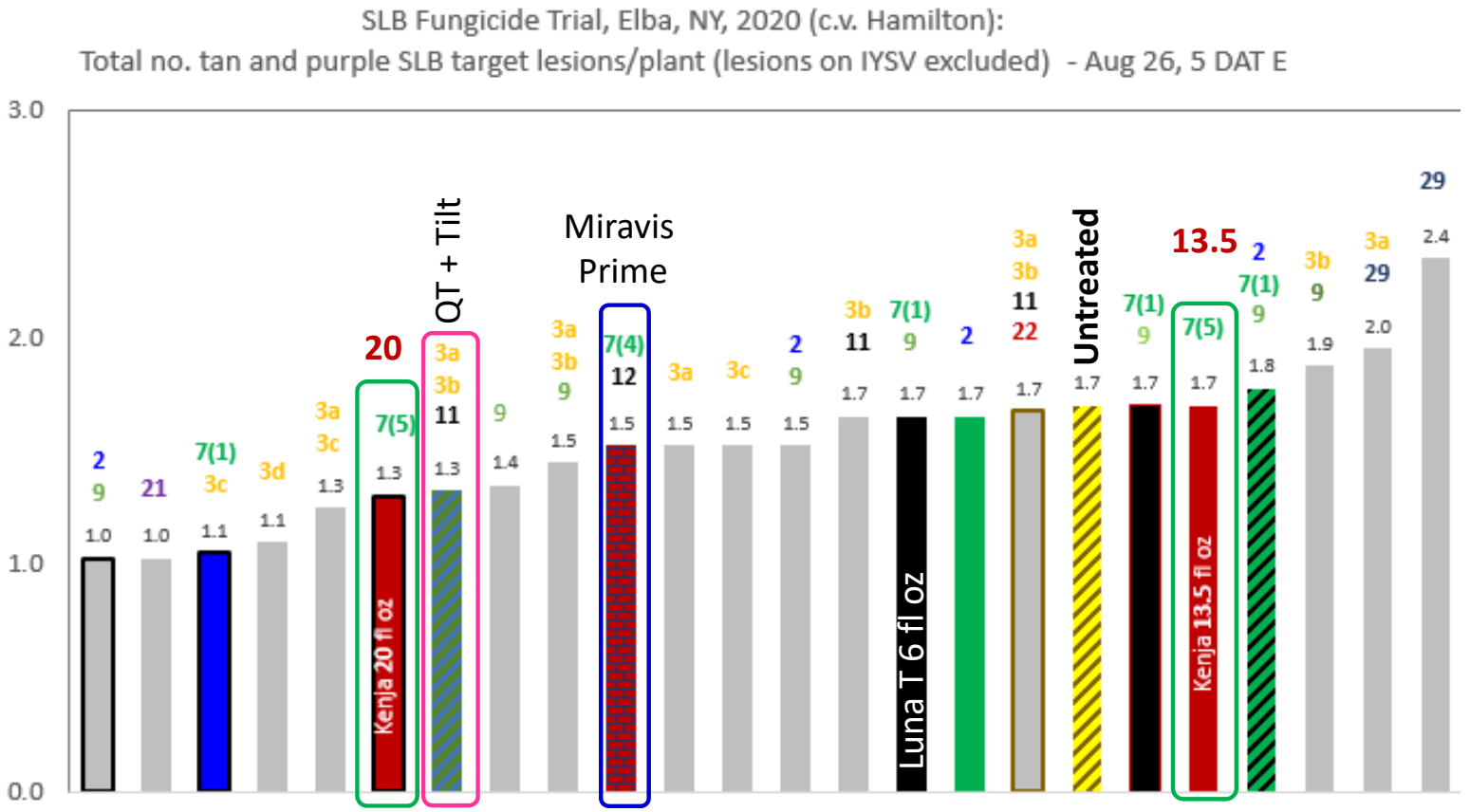
Hoepting et. al. 2020

2020 Elba Fungicide Product Trial
No. SLB Target Spots/Plant Aug 25 - 5 DAT E (5 sprays)

FRAC 7(5):
Kenja

- Low rate no different than untreated.
- High rate no different than QT + Tilt.

FRAC 7(4) + 12:
Miravis Prime



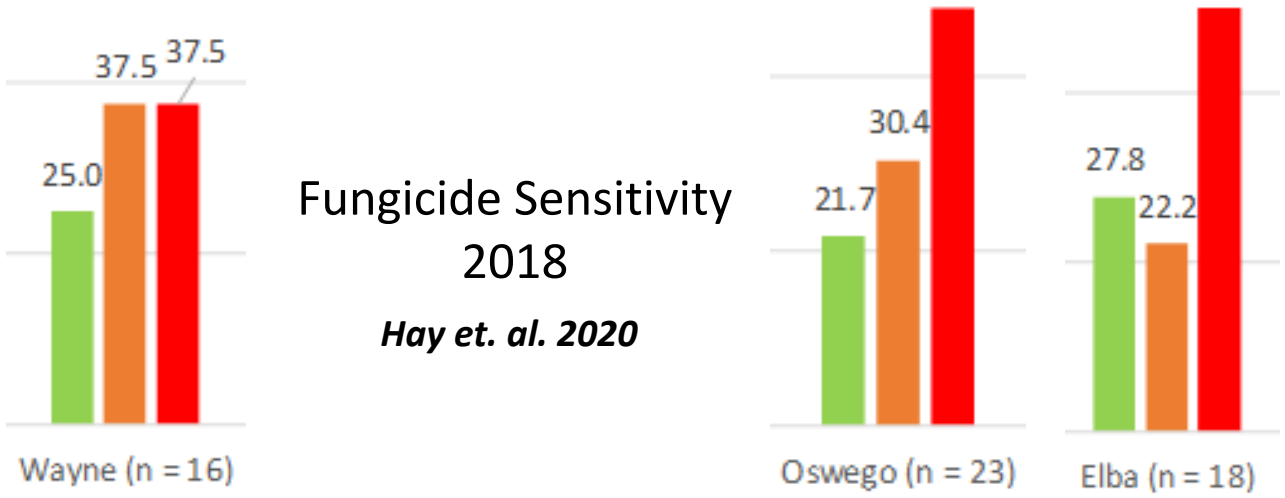
Hoepting et. al. 2020

Relationship Between Fungicide Use and Fungicide Resistance by Region

Never — Always

Light — 2017-2019: Fungicide Programs that use > 3 apps/FRAC 7 — Heavy

Wayne Co. **Oswego Co.** **Elba**

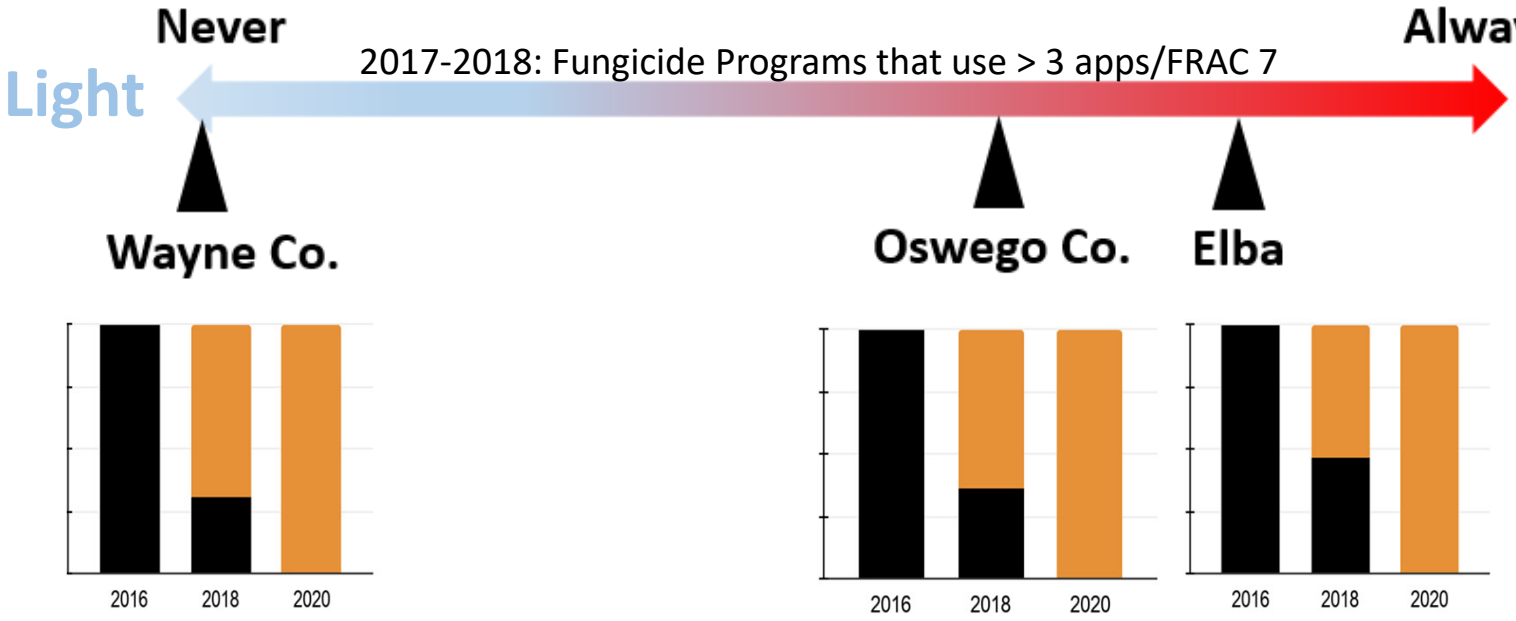


Fungicide Sensitivity 2018

Hay et. al. 2020

No difference among geographic regions despite different FRAC 7 fungicide use.

Relationship Between Fungicide Use and Fungicide Resistance By Region



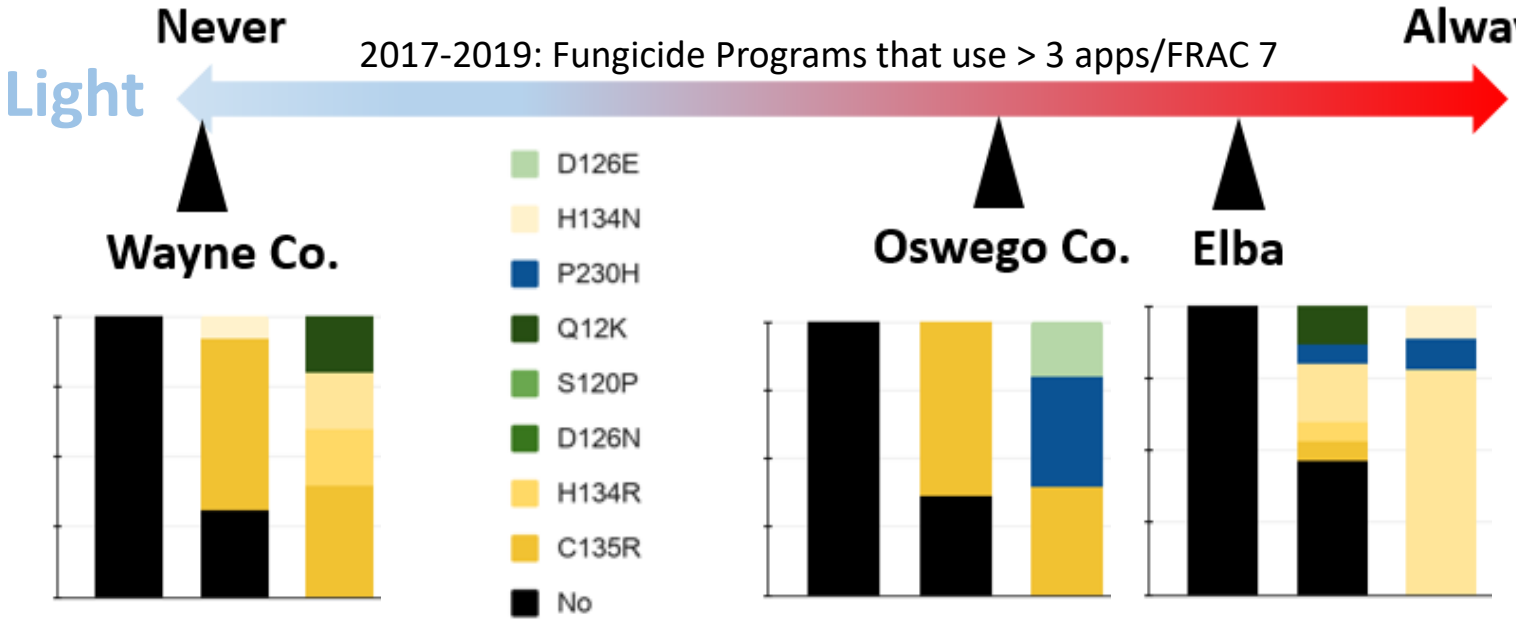
No difference among geographic regions despite different FRAC 7 fungicide use.

Presence of gene mutations in *sdh* genes
(% of isolates tested)

Heck et. al. 2020

Is it over?

Relationship Between Fungicide Use and Fungicide Resistance By Region



Presence of gene mutations in *sdh* genes
(% of isolates tested)

But there are differences in which *sdh* genes mutated among geographic regions.

- No *sdh*B (blue) gene mutations in Wayne.
- No *sdh*D (green) gene mutations in Oswego.

Heck et. al. 2020

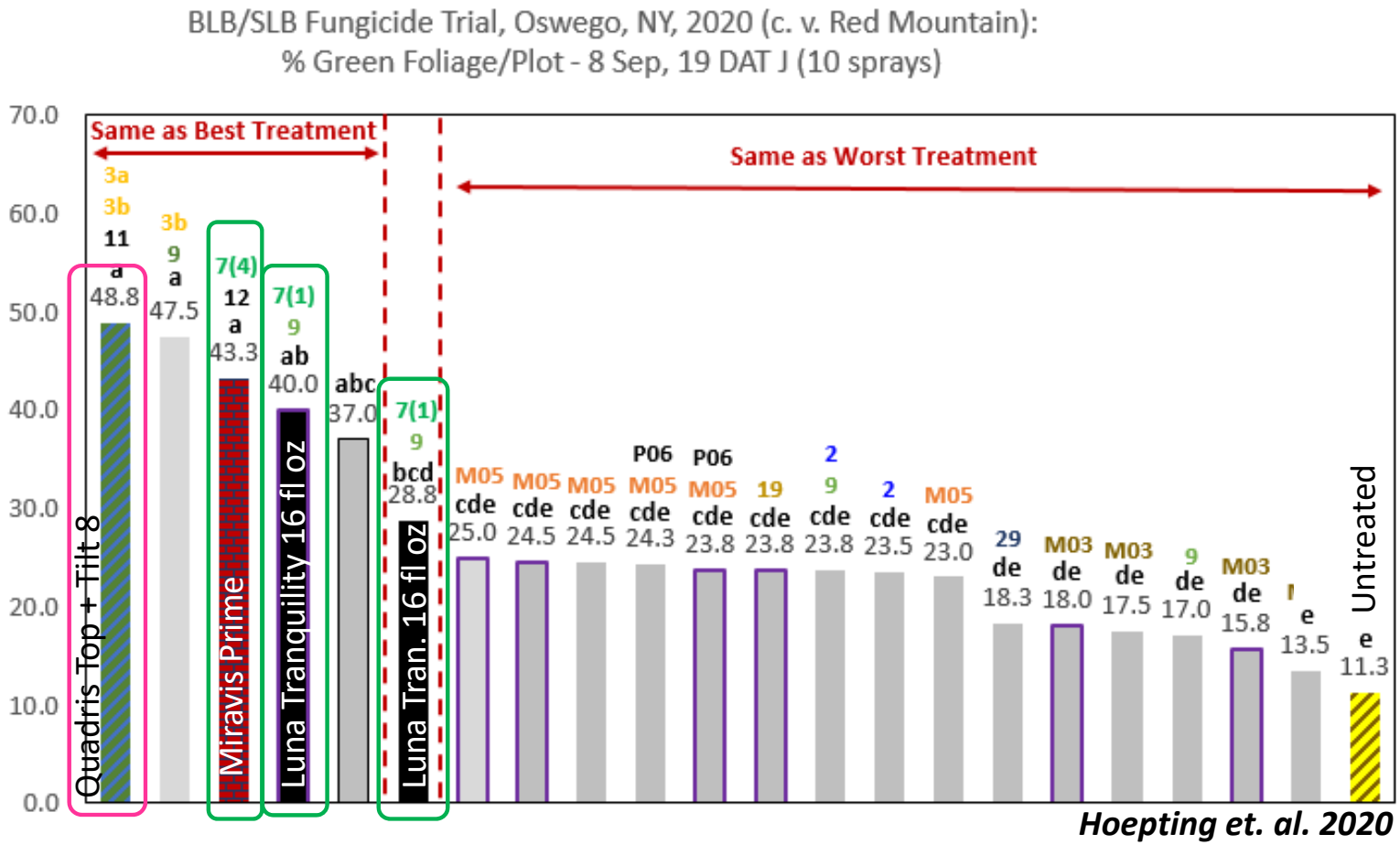
2020 Oswego Early Fungicide Trial
% Green Foliage Sep 8 19 DAT J (10 sprays)

BEST
FRAC 3b + 3a:
Quadris Top 14 fl oz
+ Tilt 8 fl oz

FRAC 7(1)
Luna Tranquility **16 fl oz**
7(1) + 9a

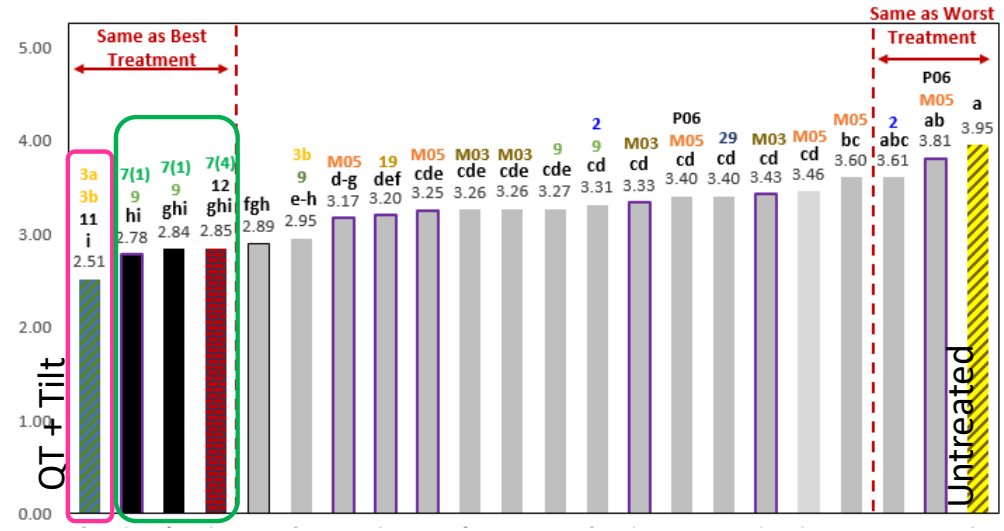
FRAC 7(4)
Miravis Prime 11.4 fl oz
7(4) + 12

As good as Qt + Tilt

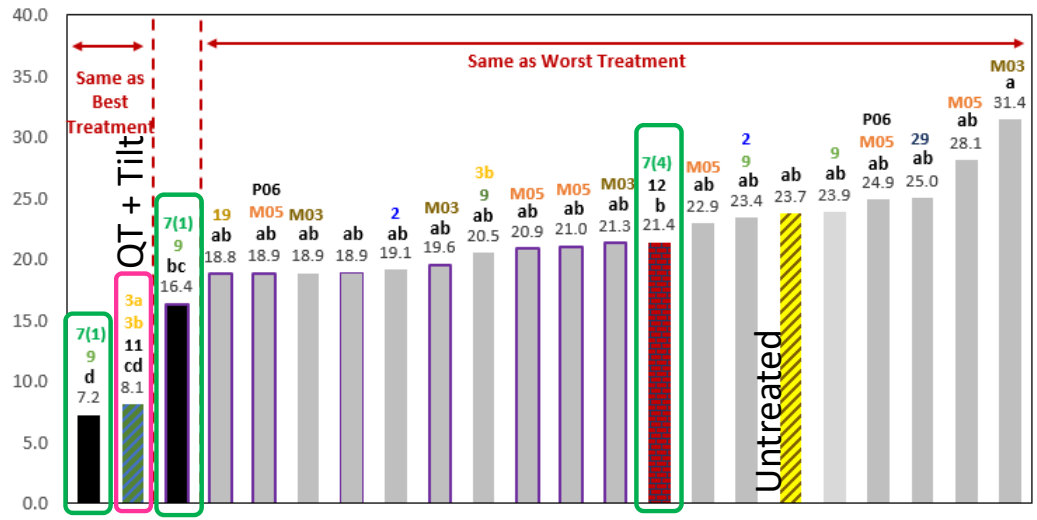


2020 Oswego Early Fungicide Trial
SLB Spores & Spots Sep 8 19 DAT J (10 sprays)

SLB Severity (Tip Colonization)



No. Target Spots/plant



BEST
FRAC 3b + 3a:
Quadris Top 14 fl oz + Tilt 8 fl oz

FRAC 7(1)
Luna Tranquility **16 fl oz**
7(1) + 9a

FRAC 7(4)
Miravis Prime 11.4 fl oz
7(4) + 12

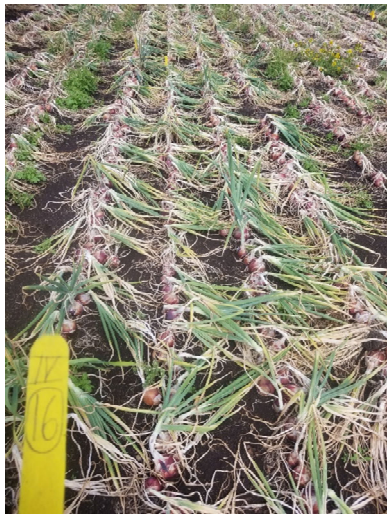
Appears that FRAC 7 subclasses 1 and 4 are still working on this farm in Oswego.

- May be regional differences.

Hoepting et. al. 2020

2020 Oswego Early Fungicide Trial
% Green Foliage Sep 8 19 DAT J (10 sprays)

48.8%



Quadris Top 14 fl oz
+ Tilt 8 fl oz
3b + 3a

43.3%

Miravis Prime
11.4 fl oz
7(4) + 12

40%

Luna Tranquility
16 fl oz
7(1) + 9b

28.8%

Luna Tranquility
16 fl oz
7(1) + 9b

5.3%

Untreated

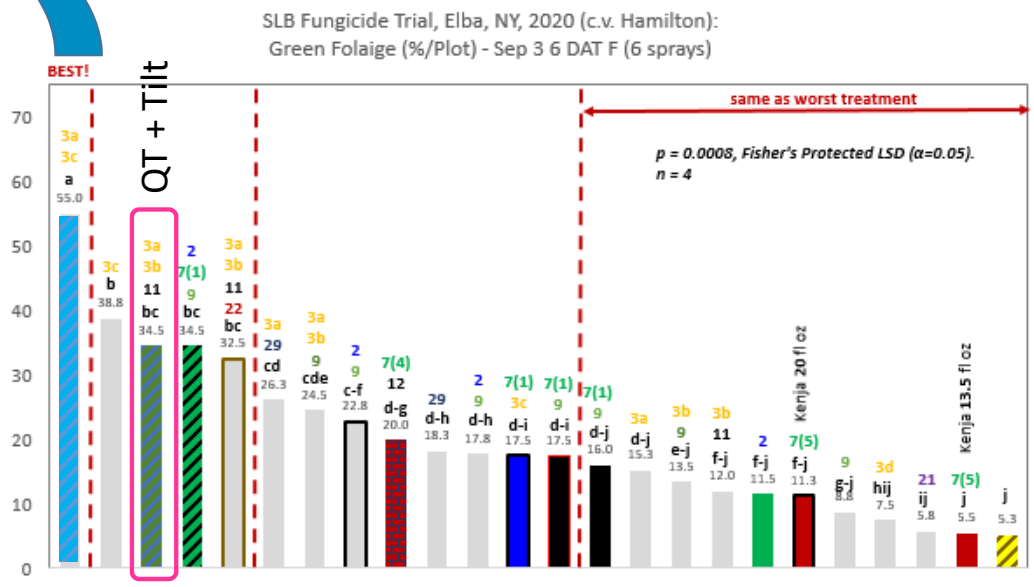
2020 Elba Fungicide Product Trial
% Green Foliage Sep 3 6 DAT F (6 sprays)

55%

3a + 3c

34.5%

Quadris Top 14 fl oz
+ Tile 8 fl oz
3b + 3a



Hoepting et. al. 2020

3a + 3c had significantly more green foliage than Quadris Top + Tilt

No Fungicide Recommendations Today – Next Steps

More results to come:

- Follow up gene mutation results with fungicide sensitivity testing to identify what the gene mutations mean
  - Insensitive vs, moderately sensitive
  - Cross-resistance among FRAC 7 sub-classes
- FRAC 3 fungicide sensitivity testing
- BLB fungicide trial results

Wish list:

- Evaluate rate of SLB to develop fungicide resistance (SLB isolates collected from Elba trial)
  - Weekly application SLB fungicide
  - Co-application of SLB fungicides
  - Rotate SLB fungicide with biological or protectant fungicide
  - Bi-weekly applications of SLB fungicide
- FRAC 2 & 9 fungicide testing?
- FRAC 7 results by farm unlikely

Will be in touch with 2020 FINAL results and new fungicide recommendations – Stay tuned!

Onion Researchers in Training

Poll Question

In your opinion, what is the most effective strategy for managing fungicide resistance? (one answer)

1. Rotate FRAC groups
2. Co-apply FRAC groups
3. Reduce total number of apps per FRAC per crop
4. Use highest label rates
5. All of the above